

Appln No. 09/828,304

Amdt date September 22, 2003

Reply to Office action of June 27, 2003

REMARKS/ARGUMENTS

The remarks that follow are responsive to the Office Action mailed on June 27, 2003, on the above-referenced application.

The Examiner objected to the specification based on several informalities concerning the figure captions for FIG. 1a to 1c. Applicants have amended the specification and Figures 1a to 1c to provide unique identifiers for each of the features in each of the figures. No new matter has been added by these amendments.

In the Office Action the Examiner rejected claims 1-55 under 35 U.S.C. §112, first paragraph as being indefinite for the term "sparsely cross-linked". Applicants respectfully traverse this rejection.

Under the MPEP the sufficiency of the written description to support a particular claim limitation must be made both in light of the entire teaching of the specification and the level of skill in the art. (MPEP §2163(II)(A)(2)). Specifically, the Applicants provide numerous lengthy explanations of the meaning of the term "sparsely cross-linked" within the specification that provides sufficient explanation that one of skill in the art of polymer chemistry would well-understand Applicants' meaning.

For example, the specification states:

In one embodiment, the invention is directed to an electro-optically active, homogeneously dispersed polymer gel layer of liquid crystalline material comprising a permanently oriented anisotropic network of polymerized material containing molecules of at least one sparsely cross-linked homogeneously dispersed polymer solvated by molecules of at least

Appln No. 09/828,304

Amdt date September 22, 2003

Reply to Office action of June 27, 2003

one liquid crystalline material or mesogen, wherein the polymer is provided in low enough concentrations such that the switching response of the liquid crystal polymer gel is acceptably fast for electrooptic operations.

[Specification, page 4, line 32 to page5, line5, underlining added for emphasis.]

The specification goes on to state that:

Although any suitably dilute concentration of polymer may be utilized such that the switching speed of the liquid crystal is not significantly reduced (for example, where the switching time more than doubles over the switching time of the pure liquid crystal molecules) and such that the polymer molecules are capable of sparsely cross-linking to form the polymer network, in one preferred embodiment the electro-optically active layer comprises less than 5% of the gel layer by mass and more preferably equal to or less than 2% of the gel layer by mass.

[Specification, page 5, lines 13 to 19, underlining added for emphasis.]

Similar disclosures can be found throughout the specification at page 5, lines 20 to 24 and page 10, line 30 to page 11, line 5. Applicants suggest that one of skill in the art of polymer chemistry reading these sections of the specification would understand the intended meaning of the term "sparsely cross-linked" to relate to the concentration and size of polymer necessary to ensure the formation of a polymer network while maintaining adequate switching speed in the stabilized liquid crystal material. Accordingly, Applicants respectfully request the Examiner to withdraw this grounds of rejection in light of the inherent support for the term in the specification.

Appln No. 09/828,304

Amdt date September 22, 2003

Reply to Office action of June 27, 2003

The Examiner rejected claims 1 to 5, 7 to 13, 15 to 19, and 22 to 55 under 35 U.S.C. §102(b) as being anticipated by Kubota, et al. (U.S. Patent No. 6,128,056). Applicants respectfully traverse this rejection.

The claims of the current invention are directed to:

An electro-optically active gel layer having nematic, ferroelectric, antiferroelectric or electroclinic properties comprising a quantity of aligned liquid crystal molecules having an anisotropic three-dimensional polymer network homogenously dispersed therein, wherein the polymer network comprises a plurality of sparsely cross-linked polymer molecules.
(Claim 1, underlining added for emphasis.)

The importance of this quality is also clearly recited in the specification of the current application which stated in part:

A second method uses a phase-separated polymer to control alignment and provide mechanical stability, rather than an alignment layer However, while this arrangement is intended to improve mechanical stability, of ferroelectric liquid crystals it results in reduced switching speed for the electrooptic device.
(Specification, page 3, line 12 to page 4, line 3.)

In contrast, the material described in the Kubota, et al. can be in no way considered a gel comprised of an anisotropic homogenously dispersed polymer network. Specifically, Kubota, et al. write the following concerning their material:

. . . the liquid crystals are dispersed and held in the networks of matrix in the three dimensional network form comprising the polymer compound; and that a percentage of liquid crystal in the active area and a percentage of liquid crystal in the non-active area are so formed as to be different from each other.
[Kubota, et al., col. 7, lines 42 to 47.]

Appln No. 09/828,304

Amdt date September 22, 2003

Reply to Office action of June 27, 2003

Moreover, the important of this distinction is highlight by Kubota, et al., which state:

According to this construction, a percentage of liquid crystal in the non-active area and a percentage of liquid crystal in the active area are so formed as to be different from each other. This can produce the result that in a reliability test, for example, in which the liquid crystal display element is allowed to stand in the environment in which ambient temperature varies from high temperature to low temperature, development of cracks is prevented in the polymer liquid crystal composite layer in the vicinity of the sealant.

[Kubota, et al., col. 7, lines 48 to 57.]

Nowhere, do Kubota, et al. ever disclose, teach, or even suggest that the liquid crystal/polymer composite should be "homogeneously dispersed", as recited by Applicants claims. Indeed, Kubota, et al. not only teach a heterogeneous mixture of polymer and liquid crystal, but also emphasize the importance of such a heterogeneous construction to the proper operation of the invention. Accordingly, Applicants submit that the disclosure of the Kubota, et al. reference cannot be said to anticipate the claims of the current invention.

The Examiner rejected claims 1 to 15, 18 to 23, 27 to 33, 35 to 39, and 41 to 55 under 35 U.S.C. §102(b) as being anticipated by Kajiyama, et al. (European Patent No. 0 501 409). Applicants respectfully traverse this rejection.

As discussed before the claims of the current invention specifically require a gel having "a quantity of aligned liquid crystal molecules having an anisotropic three-dimensional polymer network homogenously dispersed therein".

Appln No. 09/828,304

Amdt date September 22, 2003

Reply to Office action of June 27, 2003

In contrast, the polymer networks described in the Kajiyama, et al. reference are specifically not "homogeneously dispersed" as recited in the current claims, and so inherently do not provide the "gel" taught by Applicants. In particular, Kajiyama, et al. summarize their invention as follows:

A liquid crystal display device which has a pair of transparent electrodes and a composite film having continuous pores of a polymer matrix filled with a liquid crystal material

(Kajiyama, et al., abstract, underlining added for emphasis.)

In short, nowhere do Kajiyama, et al. describe, teach, or even suggest the "homogeneous" gels recited in the claims of the current invention, but rather they describe phase separated materials having pores or pockets made of a polymer phase filled with a liquid crystal material. Indeed, Kajiyama, et al. explicitly recite the importance of this "phase separation" stating:

In addition, since the liquid crystal is clearly separated from the polymer matrix, the uniformity of the liquid crystal phase in the composite film is increased, and the liquid crystal phase can respond quickly to the applied voltage so that the operation voltage is decreased.

(Kajiyama, et al., page 4, lines 31 to 33, underlining added for emphasis.)

Accordingly, Applicants respectfully submit that the materials described in Kajiyama, et al. cannot be said to anticipate the claims of the current application.

The Examiner rejected claims 1 to 25, 27 to 33, and 35 to 55 under 35 U.S.C. §102(b) as being anticipated by Toshida, et

Appln No. 09/828,304
Amdt date September 22, 2003
Reply to Office action of June 27, 2003

al. (U.S. Patent No. 5,812,227). Applicants respectfully traverse this rejection.

As discussed before the claims of the current invention specifically require a gel having a "three-dimensional polymer network homogenously dispersed therein".

In contrast, the materials described in the Toshida, et al. reference, like the materials described in the Kajiyama, et al. reference are specifically not "homogeneous" gels as recited in the current claims, and so inherently do not provide the type of "haze free" electro-optic materials taught by Applicants. In particular, Toshida, et al. write:

The display layer comprises a porous polymer material having open pores partially filled and a low-molecular weight mesomorphic compound impregnating the porous polymer material.
(Toshida, et al., abstract, underlining added for emphasis.)

In short, like the Kajiyama, et al. reference nowhere do Toshida, et al. describe, teach, or even suggest "homogeneous" gels as recited in the claims of the current invention, but rather phase separated polymer networks having pores which are "partially filled" with a liquid crystal material. Accordingly, Applicants respectfully submit that the materials described in Toshida, et al. cannot be said to be homogeneous gels and therefore cannot be said to anticipate the claims of the current application.

The Examiner also rejected claims 26 and 34 under 35 U.S.C. §103(a) as unpatentable over the combination of Kajiyama, et al. or Toshida, et al., in view of Kubota, et al.; and claim 6 under 35 U.S.C. §103(a) as unpatentable over Kubota, et al., in view

Appln No. 09/828,304

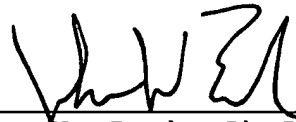
Amdt date September 22, 2003

Reply to Office action of June 27, 2003

of Kajiyama, et al. Applicants respectfully traverse these rejections for the reasons stated above with regard to the rejections based on the above-cited references individually. Specifically, none of the above references alone or in combination describe, teach, or even suggest an electro-optically active gel layer having "a quantity of aligned liquid crystal molecules having an anisotropic three-dimensional polymer network homogenously dispersed therein" as required by the claims of the current application. Accordingly, one of skill in the art having read the cumulative references would have had no motivation or guidance to construct an electro-optically active gel layer as taught by Applicants. As such, Applicants respectfully request reconsideration and withdrawal of these grounds of rejection.

In view of the foregoing remarks, reconsideration and allowance of this application are respectfully requested. However, the Examiner is kindly requested to call the undersigned attorney if he should he deem any claim presently in the application unpatentable.

Respectfully submitted,
CHRISTIE, PARKER & HALE, LLP

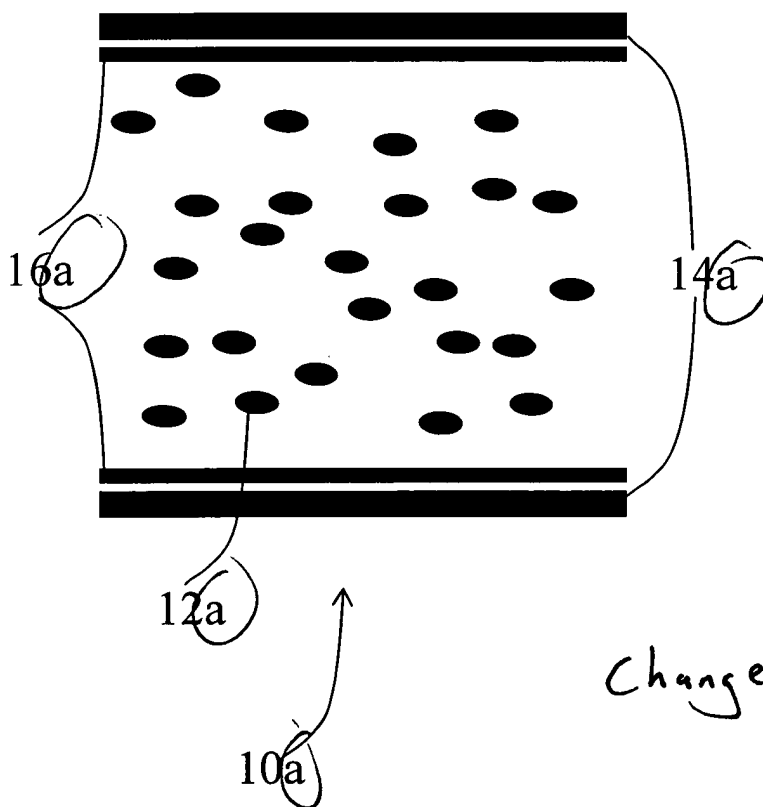
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Application No. 09/828,304
Amdt. Dated September 22, 2003
Reply to Office Action of June 27, 2003
Annotated Sheet Showing Changes

FIG. 1a

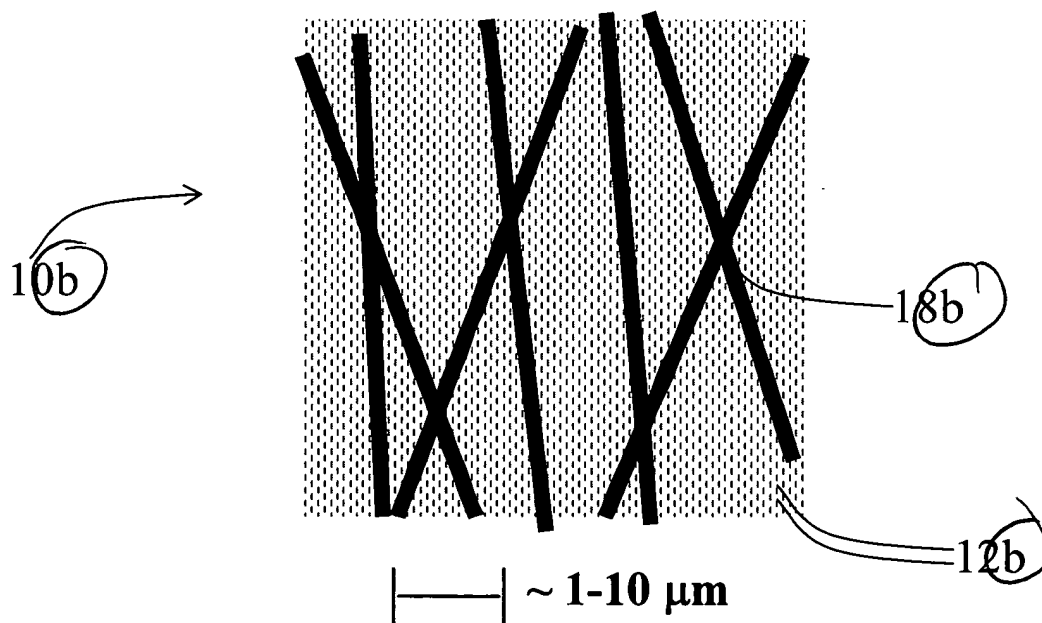


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Application No. 09/828,304
Amdt. Dated September 22, 2003
Reply to Office Action of June 27, 2003
Annotated Sheet Showing Changes

FIG. 1b

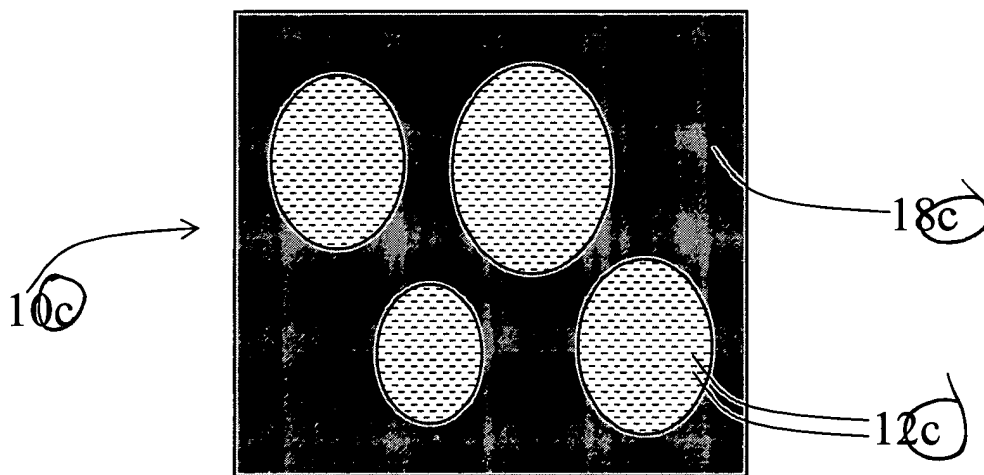


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Application No. 09/828,304
Amdt. Dated September 22, 2003
Reply to Office Action of June 27, 2003
Annotated Sheet Showing Changes

FIG. 1c



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